APPLICATION NO. 09/846,410

TITLE OF INVENTION: Multiple Data Rate Hybrid Walsh Codes

for CDMA

INVENTOR: Urbain A. von der Embse

ADMENDMENT TO THE CLAIMS

List of all claims for application 09/846,410

Claims 1-4   (Cancelled)

Claim 5   (new)

Claim 6   (new)

p.1 claim amendments to application 09/846,410

In line 1-2 please add the underlined words and delete the strikethrough word

In line 8 please add the underlined word

In lines 11-32 please delete the strikethrough text for the cancelled Claim **1**

APPLICATION NO. 09/846.410

TITLE OF INVENTION: Multiple Data Rate ~~Complex~~ Hybrid Walsh Codes
for CDMA

5   INVENTOR~~S~~: Urbain A. von der Embse

CLAIMS

10   WHAT IS CLAIMED IS:

Claim **1**.(Cancelled) ~~A means for the implementation of new fast~~
~~algorithms for complex Walsh orthogonal CDMA encoding and~~
~~decoding of multiple data rate users over a CDMA frequency band~~
~~with properties which~~

15   ~~provide a complex Walsh orthogonal code with the real~~
~~component equal to the real Walsh orthogonal code, and with the~~
~~imaginary component equal to a reordering of the real Walsh~~
~~orthogonal code which makes the complex Walsh orthogonal code the~~
~~correct complex version of the real Walsh orthogonal code to~~

20   ~~within arbitrary angle rotations and scale factors~~
~~provide complex Walsh orthogonal CDMA codes which reduce to~~
~~the real Walsh orthogonal CDMA codes upon removal of the~~
~~imaginary code components~~
~~provide a means to encode and decode multiple data rate~~

25   ~~users with complex Walsh orthogonal codes for simultaneous~~
~~transmission over the same CDMA frequency band with~~
~~computationally efficient algorithm means to implement the~~
~~encoding and decoding~~
~~provide a computationally efficient algorithm mmeans to~~

30   ~~encode and decode multiple data rate users with complex Walsh~~
~~orthogonal codes with values +/-1 +/-j, for simultaneous~~
~~transmission over the same CDMA frequency band~~

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p.2 claim amendments to application 09/846,410

In lines 1-16 please delete the strikethrough text for the cancelled Claim **2**

Claim **2**.(Cancelled) ~~A means for the implementation of new hybrid complex Walsh orthogonal CDMA encoding and decoding of multiple data rate users over a CDMA frequency band with properties~~

5 ~~provide a means for the construction of hybrid complex Walsh orthogonal CDMA codes which are functional combinations of the complex Walsh, discrete Fourier transform (DFT), Hadamard (real Walsh), and other orthogonal codes and which offer wider choices of code lengths~~

10 ~~provide a means to extend the complex Walsh orthogonal CDMA codes to include the complex discrete Fourier transform (DFT) codes and other orthogonal codes to allow greater flexibility in the choices for the code lengths~~

~~provide new fast algorithm means for the encoding and~~
15 ~~decoding of hybrid complex Walsh codes for multiple data rate users~~

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p. 3 claim amendments to application 09/846,410

In lines 1-19 please delete the strikethrough text for the cancelled Claim **3**

Claim **3.** (Cancelled) ~~A means for the design of hybrid complex~~
~~Walsh orthogonal CDMA encoding and decoding of multiple data rate~~
~~users over a CDMA frequency band with properties~~

~~provide a means to provide greater flexibility in the~~
~~selection of the code length by combining the complex Walsh~~
~~orthogonal CDMA codes with the complex DFT orthogonal CDMA codes~~
~~as well as with other orthogonal codes~~

~~provide a Kronecker product means to combine the complex~~
~~Walsh orthogonal CDMA codes with complex DFT orthogonal CDMA~~
~~codes as well as with other orthogonal CDMA codes t~~

~~provide a direct sum means to combine the complex Walsh~~
~~orthogonal CDMA codes with complex DFT orthogonal CDMA codes as~~
~~well as with other orthogonal CDMA codes~~

~~provide a functionality means to combine the complex Walsh~~
~~orthogonal CDMA codes with complex DFT orthogonal CDMA codes as~~
~~well as with other orthogonal CDMA codes~~

~~provide new fast algorithm means for the encoding and~~
~~decoding of hybrid complex Walsh codes for multiple data rate~~
~~users~~

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p. 4 claim amendments to application 09/846,410

In lines 1-19 please delete the strikethrough text for the cancelled Claim **4**

Claim **4**. (Cancelled) ~~A means to provide unconstrained flexibility in the selection of the code length by functional combining of appropriate orthogonal CDMA codes drawn from a set of code candidates that include the complex Walsh and the complex DFT~~

5   ~~provide a functional means for the generation of orthogonal CDMA codes with unconstrained flexibility in the selection of the code length~~

~~provide a fast algorithm means for the encoding and decoding of CDMA codes designed with a functional means for the~~

10   ~~generation of orthogonal CDMA codes with unconstrained flexibility in the selection of the code length~~

~~provide a functional means for the generation of orthogonal CDMA codes for multiple data rate users with unconstrained flexibility in the selection of the code length~~

15   ~~provide a fast algorithm means for multiple data rate encoding and decoding of orthogonal CDMA codes which are generated by a functional means for multiple data rate users to provide unconstrained flexibility in the selection of the code length~~

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p. 5 claim amendments to application 09/846,410

In lines 1-34 please add the underlined text for the new Claim **5**

Claim **5.** (New) A method for the design and implementation of fast encoders and fast decoders for Hybrid Walsh and generalized Hybrid Walsh complex orthogonal CDMA channelization codes for multiple data rate users over a frequency band with properties

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    Hybrid Walsh inphase (real axis) codes and quadrature (imaginary axis) codes are defined by lexicographic reordering permutations of the Walsh code

10   Hybrid Walsh codes have a 1-to-1 sequency~frequency correspondence with the DFT codes and have a 1-to-1 even~cosine and odd~sine correspondences with the DFT codes

    Hybrid Walsh codes take values {1+j, -1+j, -1-j, 1-j} or
15 equivalently take values {1, j, -1, -j} with a (-45) rotation of axes and a renormalization

    generalized Hybrid Walsh codes can be constructed for a wide range of code lengths by combining Hybrid Walsh with DFT
20 (discrete Fourier transform), Hadamard and other orthogonal codes, and quasi-orthogonal PN codes using tensor product, direct product, and functional combining

    fast encoding and fast decoding implementation algorithms
25 are defined

    algorithms are defined to map multiple data rate user data symbols onto the code input data symbol vector for fast encoding and the inverses of these algorithms are defined for recovery of
30 the data symbols with fast decoding

    encoders perform complex multiply encoding of complex data to replace the current Walsh real multiply encoding of inphase and quadrature data

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p. 6 claim amendments to application 09/846,410

In lines 1-3 please add the underlined text for the new Claim **5**

decoders perform complex conjugate transpose multiply decoding of complex data to replace the current Walsh real multiply decoding of inphase and quadrature data

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p. 7 claim amendments to application 09/846,410

In lines 1-30 please add the underlined text for the new Claim **6**

Claim **6.** (New) A method for the design and implementation of encoders and decoders for complex orthogonal CDMA and generalized complex orthogonal CDMA channelization codes for multiple data rate users over a frequency band with properties

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   complex codes inphase (real axis) codes and quadrature (imaginary axis) codes are defined by reordering permutations of the real Walsh codes

10   generalized complex codes can be constructed for a wide range of code lengths by combining the complex codes with DFT (discrete Fourier transform), Hybrid Walsh, Hadamard and other orthogonal codes, and quasi-orthogonal PN codes using tensor product, direct product, and functional combining

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   fast encoding and fast decoding implementation algorithms are defined

   algorithms are defined to map multiple data rate user data
20   symbols onto the code input data symbol vector for fast encoding and the inverses of these algorithms are defined for recovery of the data symbols with fast decoding

   encoders perform complex multiply encoding of complex data
25   to replace the current Walsh real multiply encoding of inphase and quadrature data

   decoders perform complex conjugate transpose multiply decoding of complex data to replace the current Walsh real
30   multiply decoding of inphase and quadrature data

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